

Coastal Observation Technology System Project Summary – 2004

Project Name/Title: Gulf of Alaska Ecosystem Monitoring (GEM) and Research Program

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Recipient Institution: Alaska Department of Fish and Game for the Exxon Valdez Oil Spill Trustee Council

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Brief Project Summary: GEM is a long-term marine observing system dedicated to understanding the marine ecosystems of species and other natural resources injured by the *Exxon Valdez* oil spill. GEM monitors basic biological and physical variables that can be used to explain changes in populations of birds, fish, and mammals that are essential to the economic well-being of Alaskan communities in the region and that are central to the missions of state and federal resource management agencies. To meet the responsibilities of the Exxon Valdez Oil Spill Trustee Council, monitoring is directed toward understanding the long-term fate and effects of oil and its impacts on injured resources and their ecosystems.

GEM monitoring stations are chosen through research selected by an open competitive contracting process. Research is organized around four principal habitat types of the northern Gulf of Alaska, the nearshore, watersheds, Alaska coastal current, and offshore, and it is guided by a central hypothesis on how climate and other physical factors influence geochemical and biological processes to bring about changes in populations of birds, fish, and mammals. Although fiscal year 2004 is GEM's first full year of operation, it has been in planning and research since 1999. GEM's science plan and the peer review of GEM's first research plan by the National Research Council are available on the Web site. GEM is currently a mixture of operational, preoperational, and research projects.

Accomplishments to Date:

Operational Projects

- Continuous plankton recorder (CPR) on vessel of opportunity covering inland, continental shelf, and oceanic waters of the Gulf of Alaska.
- Thermosalinograph (surface) on vessel of opportunity covering inland, continental shelf, and oceanic waters of the Gulf of Alaska.

- Mooring measuring temperature and salinity at depth and surface and fluorescence at surface at site of second oldest continuously occupied oceanographic station in the North Pacific (GAK 1, University of Alaska Fairbanks).
- Thermosalinograph on coastal fisheries research trawl vessel to provide synoptic view of biological and physical conditions on long-standing historical fisheries surveys.

Preoperational Projects

- Implemented preoperational project applying physical oceanographic measurements of currents to design of regulations for salmon fishery operating in area of North America's second highest tidal height variation.
- Implemented preoperational instrument package on ferry operating over continental shelf and inland waters (surface measures of temperature, salinity, optics, nitrate).

Research Projects

- Implemented research project to define monitoring protocols for stable isotopes of nitrogen, carbon, and sulfur to identify the extent and magnitude of marine inputs of carbon and nutrients to coastal watersheds.
- Implemented research on identifying and measuring hydrocarbons in the marine environment preparatory to establishing long-term monitoring stations.
- Implemented research on establishing and measuring exposure of nearshore animals (mussels, clams, ducks, otters) to *Exxon Valdez* oil preparatory to establishing long-term monitoring stations.
- Implemented research survey of nearshore biodiversity utilizing Census of Marine Life NaGISA protocols in preparation for establishing long-term monitoring stations.

Current Year Objectives:

- Participate in establishing long-term administration and governance for regional observing system with Alaskan Ocean Observing System (AOOS).
- Maintain operational observing projects in Alaska coastal current and nearshore.
- Initiate research on biophysical model of northern Gulf of Alaska.
- Continue research for nearshore monitoring of hydrocarbons and biological species and start move into preoperational phase scheduled for fiscal year 2007
- Continue development of preoperational fisheries oceanography project on regulation of salmon fishery.
- Continue research on protocols for establishing marine–terrestrial linkages for coastal watersheds.

Partners: NOAA (National Marine Fisheries, National Ocean Service–Kachemak Bay National Estuarine Research Reserve, Pacific Marine Environmental Laboratory), Department of the Interior (U.S. Geological Survey, U.S. Fish and Wildlife Service), Alaska Department of Fish and Game, University of Alaska Fairbanks, North Pacific Research Board, Oil Spill Recovery Institute, Prince William Sound Science Center, Prince William Sound Regional Citizens Advisory Council, Prince William Sound Regional Citizens Advisory Council.